

alternate month, which, together with an 8vo volume of letter-press, will form a complete illustration of the Mammalia of Nipal."

Mr. James Hamilton Fennell, author of a very entertaining and instructive History of Quadrupeds, is preparing to publish by subscription a volume on "Shakespeare's Knowledge of the Works and Phænomena of Nature." From among the authorities given in the Prospectus in favour of such a work, we select the following:—

"All the images of nature were ever present to Shakespeare, and he drew them not laboriously, but luckily."—*Dryden*.

"Whatever object of nature, or branch of science, he either speaks of or describes, it is always with competent, if not extensive knowledge; his descriptions are still exact; all his metaphors appropriate, and remarkably drawn from the true nature and inherent qualities of each subject."—*Pope, in the Preface to his edition of Shakespeare's Works, 1725 and 1728.*

"Mr. Fennell's subject is a delightful one, and when finished in the manner that portion of it is treated which I have seen, cannot fail to make a very popular volume. It is an appendix to the text which many readers of Shakespeare must have felt the want of."—*William Yarrell, Esq. in a Letter to a Friend, dated Jan. 29, 1838.*

## PROCEEDINGS OF LEARNED SOCIETIES.

### ZOOLOGICAL SOCIETY.

February 22, 1842.—William Horton Lloyd, Esq., in the Chair.

The reading of the Second Part\* of Prof. Owen's Monograph on the *Apteryx australis*, Shaw, including its Myology, was completed.

The following is the descriptive portion of this communication:—

#### MUSCLES OF THE SKIN.

No detailed description of the muscles of the skin in Birds has been given either in the systematic works on comparative anatomy, or in particular treatises; these muscles appear indeed in general to be too irregularly or too feebly developed to have attracted much attention; brief notices are recorded of some peculiarly developed cutaneous muscles, as those which spread the plumes of the peacock, and erect the hackles of the cock; the compressors of the subcutaneous air-cells are noticed in the anatomical account of the Gannett (*Sula Bassana*†), and a more constant cutaneous muscle, viz. that which supports the crop in gallinaceous birds, is briefly mentioned and figured by Hunter ‡.

In the *Apteryx*, the subject of the present Myography, the cutaneous system of muscles presents a more distinct and extensive

\* See Transactions of the Zoological Society, vol. ii. part 4. p. 257, Splanchnology and Osteology.

† Proceedings of Zoological Society, 1832, p. 91.

‡ In description of pl. 10, vol. i. of Physiolog. Catalogue of Hunterian Collection, by Owen, 4to. 1833-1841.

development than has hitherto been met with in the class of Birds—a condition which is evidently connected with the peculiar thickness of the integument, and probably with the burrowing habits of the present species, which possesses in this structure the power of shaking off the loose earth from its plumage, while busy in the act of excavating its chamber of retreat and nidification.

*Constrictor colli.*—The whole of the neck is surrounded by a thin stratum of muscular fibres, directed for the most part transversely, and extending from an attachment along the median line of the skin at the back of the neck, to a parallel raphé on the median line of the opposite side: this muscle is strongest at its commencement or anterior part, where the fibres take their origin in a broad fasciculus from the outer part of the occipital ridge; these run obliquely downwards and forwards on each side of the neck, but are continued uninterruptedly with those arising from the dorsal line of the skin above mentioned; the direction of the fibres insensibly changing from the oblique to the transverse. The outer surface of this muscle is attached to the integument by a thin and dense layer of cellular tissue, devoid of fat; the under surface is more loosely connected with the subjacent parts by a more abundant and finer cellular tissue.

*Use.*—To brace the cervical integument, raise the neck feathers, and in combination with the following muscle to shake these parts.

*Sterno-cervicalis.*—*Origin.* Fleshy, from the posterior incurved process of the sternum, from the ensiform prolongation and middle line of the outer and posterior surface of the same bone. *Insertion.* The fibres pass forward, and diverging in gently curved lines, ascend upon the sides of the broad base of the neck, and are inserted by a thin but strong fascia into the median line of the dorsal integument. This muscle is a line in thickness at its origin, but becomes thinner as it expands; the anterior part is covered by the posterior fibres of the *constrictor colli*.

*Use.*—To retract the skin of the neck, and brace that portion which covers the base of the neck; when these are the fixed points, it will depress and protract the sternum, and thus aid in inspiration.

*Obs.*—In its position and the general course of the fibres, this muscle is analogous to that which supports and assists in emptying the crop in the common fowl; but the œsophagus presents no partial dilatation in the *Apteryx*, and the situation of the crop is occupied by a large mass of fat enclosing one or two absorbent glands.

*Sterno-maxillaris.*—This muscle appears at first view to be the anterior continuation of the preceding, but is sufficiently distinct to merit a separate description and name. *Origin.* Fleshy; from the anterior part of the middle line of the sternum. *Ins.* It passes directly forwards along the under or anterior part of the neck, expanding as it proceeds, and gradually separating into two thin symmetrical fasciculi, which are insensibly lost in the integument covering the throat and the angle of the jaw. It adheres pretty closely to the central surface of the *constrictor colli*, along which it passes to its insertion.

*Use.*—To retract the fore-part of the skin of the neck, and also

the head. Each lateral portion acting alone would incline the head to its own side: the whole muscle in action would bend the neck; but the movements of the head and neck are more adequately and immediately provided for by the appropriate deeper-seated muscles, and the immediate office of the present muscle is obviously connected with the skin. Nevertheless, in so far as this muscle acts upon the head, it produces the same movements as the *sterno-mastoideus* in Mammalia; and it is interesting to observe, that in the long-necked Ruminants (as the Giraffe), the sterno-mastoid muscles arise by a common origin, and the insertion is by an extended fascia into the angles of the jaw: I consider, therefore, that the sterno-mastoid is represented by the *sterno-maxillaris* in the *Apteryx*, the only bird in which this muscle has hitherto been described.

*Dermo-transversalis*.—The skin covering the dorsal aspect of the lower two-thirds of the neck, besides being acted upon by the *constrictor colli*, is braced down by a thin stratum of oblique and somewhat scattered fibres, which take their origins by fasciæ attached to the inferior transverse processes of the sixth to the twelfth cervical vertebræ inclusive; the fibres pass obliquely upwards and backwards, and are inserted by a thin fascia into the median line of the skin, covering the back of the neck.

*Platysma myoides*.—The representative of this cutaneous muscle is a thin triangular layer of muscular fibres, taking their origin from the outer side of the ramus of the jaw, and diverging as they descend to spread over the throat, and meeting their fellows at a middle raphé of insertion beneath the upper larynx and beginning of the trachea, which they thus serve to compress and support.

*Dermo-spinalis*.—*Origin*. By a thin fascia from the ends of the spinous processes of the three anterior dorsal vertebræ. *Ins*. The fibres slightly converge to be attached to the integument covering the scapular region.

*Dermo-iliacus*.—*Origin*. Fleishy, from the anterior margin of the ilium. *Ins*. The fibres pass forwards and slightly converge to be inserted into the scapular integument.

*Dermo-costalis*.—A muscle resembling the preceding in form. *Origin*. Fleishy, from the costal appendages of the seventh and eighth ribs. *Ins*. The fibres pass forwards and join those of the preceding muscle, to be inserted into the scapular integument.

*Obs*. The three preceding muscles are broad and thin, but well-defined; they would appear to influence the movements of the rudimentary spur-armed wing through the medium of the integument, as powerfully as do the rudimental representatives of the true muscles of the anterior extremity.

There are also two muscles belonging to the cutaneous series, and inserted directly into the bones of the wing. One of these, the *dermo-ulnaris*, is a small, slender, elongated muscle, which takes its origin from the fascia beneath the *dermo-costalis*; its fibres pass backwards, and converge to terminate in a very slender tendon which expands into a fascia, covering the back part of the elbow joint.

*Use*. To extend the elbow joint and raise the wing.

The *dermo-humeralis* is also a long and narrow strip, deriving its

origin from scattered tendinous threads in the subcutaneous cellular tissue of the abdomen: it passes upwards, outwards and forwards, and is inserted fleshy into the proximal part of the humerus, which it seems to depress\*.

#### MUSCLES OF THE TRUNK.

##### A. On the Dorsal Aspect.

The muscles on the dorsal aspect of the vertebral column in Birds have only of late years received any attention from Comparative Anatomists: they have been mentioned rather than described by Tiedemann and Meckel: Carus has given a side-view of the superficial layer of muscles in the Sparrow-hawk; their best description is contained in the second edition of the 'Leçons d'Anatomie Comparée' of Cuvier.

The muscles of the back are in general so feebly developed in birds of flight, that they were affirmed by Cuvier to be wanting altogether in the first edition of the 'Leçons.' And this is almost true as respects their carneous portion, for they are chiefly tendinous in Birds of Flight. In the Struthious birds, and in the Penguin, in which the dorsal vertebræ are unfettered in their movements by ankylosis, these muscles are more fleshy and conspicuous; but they attain their greatest relative size and distinctness in the *Apteryx*.

From the very small size of the muscles which pass from the spine to the scapula and humerus in the *Apteryx*, the true muscles of the back, which correspond to the second layer of the dorsal muscles in Man, become immediately visible on removing the dorsal integuments and fasciæ; they consist of the *sacro-lumbalis*, *longissimus dorsi*, and *spinalis dorsi*. The first two muscles are blended together at their posterior origins, but soon assume the disposition characteristic of each, as they advance forwards.

The *sacro-lumbalis* is a strong and fleshy muscle, six lines in breadth, and three or four lines in thickness: it is, as usual, the most external or lateral of the muscles of the back, and extends from the anterior border of the ilium to the penultimate cervical vertebra. *Origin*. By short tendinous and carneous fibres from the outer half of the anterior margin of the ilium, and by a succession of long, strong, and flattened tendons from the angles of the fifth and fourth ribs, and from the extremities of the transverse processes of the third, second, and first dorsal vertebræ; also by a shorter tendon from the transverse process of the last cervical vertebra; these

\* In Mammalia the cutaneous muscles form a more continuous stratum than in the *Apteryx* and other birds, and hence have been grouped together under the common term *panniculus carnosus*; they have also, in general, both their origins and insertions in the integument; but in Birds, in which the integument supports so extraordinary an abundance of the epidermic material under the form of feathers, the muscles destined to its especial motions require a more fixed attachment from which to act. The Rhinoceros, in which the integuments, from the thickness and density of its corium, is in a similar condition as regards the resistance to be overcome by the skin-muscles, presents an analogous condition of its *panniculus carnosus*, having it divided into several distinct muscles, most of which take their origin from bone or fasciæ attached to bone.

latter origins represent the *musculi accessori ad sacro-lumbalem*; they have not hitherto been described in the class of Birds: to bring them into view, the external margin of the *sacro-lumbalis* must be raised. These accessory tendons run obliquely forward, expanding as they proceed, and are lost in the under surface of the muscle.

*Insertion.* By a fleshy fasciculus with very short tendinous fibres into the angle of the sixth rib, and by a series of corresponding fasciculi, which become progressively longer and more tendinous, into the angles of the fifth, fourth, third and second ribs, and into the lower transverse processes of the first dorsal and last two cervical vertebræ; the last insertion is fleshy and strong; the four anterior of these insertions are concealed by the upper and outer fleshy portion of the *sacro-lumbalis*, which divides into five elongated fleshy bundles, inserted successively into the upper transverse processes of the first three dorsal and last two cervical vertebræ. These last insertions seem to represent the continuation of the *sacro-lumbalis* in Man, which is termed the *cervicalis descendens* or *ascendens*.

*Longissimus dorsi.*—This muscle is blended posteriorly both with the *sacro-lumbalis* and the *multifidus spinæ*, and anteriorly with the outer portion of the *spinalis dorsi*. It extends as far forward as the thirteenth cervical vertebra. *Origin.* From the inner or mesial half of the anterior margin of the ilium; from a strong aponeurosis attached to the spines of the eighth, seventh and sixth dorsal vertebræ; and from the transverse processes of the sixth, fifth, fourth and third dorsal vertebræ. *Ins.* The carneous fibres continued from the second origin, or series of origins, incline slightly outwards as they pass forward, and are inserted into the posterior articular processes of the first three dorsal vertebræ, receiving accessory fibres from the *spinalis dorsi*. The fasciculi from the transverse processes above mentioned incline inwards, and are also inserted into the posterior oblique processes of the vertebræ anterior to them; they soon begin to form a series of oblique carneous fasciculi, which become more distinct as they are situated more anteriorly; they are at first implanted in the vertebra next in front of that from which they rise, and then into the vertebra next but one in front; so that the most anterior of these tendons of insertions, to which can be traced any of the fibres of the main body of the *longissimus dorsi*, is that which is implanted into the thirteenth cervical vertebra; it is this fasciculus which is joined by the first or most posterior of the fasciculi of the *longus colli posticus*.

A series of oblique carneous fasciculi, evidently a continuation of, or part of the same system with those in which the *longissimus dorsi* terminates anteriorly, is continued between the upper transverse and the oblique processes of the vertebræ as far forward as the fourth cervical vertebra. This series of muscles seems to represent the *transversalis colli\**, which is the anterior continuation of the *longissimus dorsi* in Mammalia, but it differs in being inserted into the oblique, instead of the transverse processes. In the direction of their fibres

\* It is the '*grand transversaire*' of Cuvier, loc. cit. p. 282; but he describes it as passing from the anterior articular process of one vertebra to the posterior articular process of the next in front.

these fasciculi resemble the *semispinalis colli*, but are inserted into the oblique processes instead of the spines of the vertebræ. There are no other muscles with which they can be compared in the Mammalia than these two, with neither of which however do they precisely correspond; they seem however clearly to represent the second series of oblique muscular fasciculi in the trunk of Fishes. Rather than hazard expressing an incomplete or false analogy, I shall term these collectively the *fasciculi obliqui*.

*Obliquus colli*.—The fasciculi which rise from the first two dorsal and five lower cervical vertebræ are joined near their tendinous terminations by corresponding fasciculi of the *longus colli posticus*, and the strong round tendons continued from the points of convergence of these fascicles are inserted successively into the posterior oblique processes of the twelfth to the sixth cervical vertebra inclusive; the two fasciculi next in succession receive no accessory fibres from the *longus colli posticus*; the anterior one derives an extensive origin from the upper transverse processes of the eighth, seventh, and sixth cervical vertebræ. It must be observed, however, that the whole of each fasciculus is not expended in the strong round tendinous insertion above described; the portion which arises from the anterior ridge of the transverse process passes more directly inwards than the rest, and is attached to the tendon which terminates the fasciculus immediately behind; at the middle of the neck these accessory fibres approach to the character of distinct origins. The tendons of insertion, moreover, severally receive accessory fleshy fibres from the base of the oblique processes of the two vertebræ next behind; and thus they become the medium of muscular forces acting from not less than five distinct points, the power of which is augmented by each tendon being braced down by the oblique converging series of muscles immediately anterior to it. The fasciculus from the eighth cervical vertebra, besides its insertion by the ordinary tendon, sends off externally a small pyramidal bundle of muscular fibres, which soon terminates in a long and slender tendon which is inserted into the oblique process of the third cervical vertebra. Corresponding portions of muscle are detached from the two anterior fasciculi, which converge and terminate in a common slender tendon inserted into the posterior oblique process of the fourth cervical vertebra; and thus terminates this complex muscle or series of muscles.

*Longus colli posticus*.—The most internal or mesial of the superficial muscles of the dorsal aspect of the thoracic and cervical regions, called *cervicalis ascendens* by Meckel, and compared in part with the *spinalis dorsi* by Cuvier, cannot be the representative of either of these muscles, since they both co-exist separately with it in the *Apteryx*. At its posterior part the muscle in question seems to be rather a continuation of the *longissimus dorsi*; its anterior part offers a strong analogy with the mesial portion of the *complexus* and *biventer cervicis*; it appears to me to be evidently the analogue of the first, or mesio-dorsal series of oblique fibres of the muscular system in Fishes, but I shall adopt the name of the *longus colli posticus* applied to it by Cuvier\*. It commences by long and slender, but

\* Leçons d'Anat. Comp., 2nd edit. vol. i. p. 284.

strong, subcompressed tendons from the spines of the sixth, fifth and fourth dorsal vertebræ: these tendons gradually expand as they proceed forwards and downwards, and send off from their under surface muscular fibres which continue in the same course, and begin to be grouped into distinct fasciculi at the base of the neck: the first of these bundles joins the fasciculus of the *longissimus dorsi*, which is inserted into the posterior articular process of the thirteenth cervical vertebra; the succeeding fasciculi derive their origins from a broad and strong aponeurotic sheet attached to the spines of the fourth, third and second dorsal vertebræ: the second to the eighth fasciculi inclusive are compressed, broad and fleshy, and are inserted in the strong round tendons described in the preceding muscle, and attached to the oblique processes of the twelfth to the sixth cervical vertebræ inclusive: the ninth fasciculus, which forms the main anterior continuation of the *longus colli posticus*\*, is larger than the rest, and receives, as it advances, accessory fibres from the spinous processes of the seventh to the third cervical vertebræ inclusive, and is inserted, partly fleshy, partly by a strong tendon, into the side of the broad spine of the *vertebra dentata*. A slender fasciculus is detached from the mesial and dorsal margin of the *longus colli posticus*, near the base of the neck, which soon terminates in a long round tendon: this tendon is braced down by short aponeurotic fibres to the spines of the fifth to the second cervical vertebræ inclusive, immediately beyond which it again becomes fleshy, and expands to be inserted into the occipital ridge: this portion is the *digastrique* or *biventer capitis* of Cuvier.

*Spinalis dorsi*.—The displacement of the dorsal portion of the preceding muscle and the *longissimus dorsi* brings into view the *spinalis dorsi*, which is a well-developed and distinct muscle in the *Apteryx*. *Origin*. By two long, narrow, flattened tendons, from the spines of the eighth and seventh dorsal vertebræ: these pass obliquely downwards and forwards, expanding as they proceed, and terminate in two fasciculi of muscular fibres: the posterior one passes forwards beneath the anterior one, and inclining inwards and upwards divides into two portions, inserted by long tendons into the spines of the second and first dorsal vertebræ; it then sends a few fibres forwards to join the outer and anterior fasciculus, which is partly inserted by a slender tendon into the spine of the last cervical vertebra: the rest of the fibres of the second fasciculus join the portion of the *longissimus dorsi* which is implanted into the oblique process of the last cervical vertebra. The three inserted tendons of the *spinalis dorsi* are also the medium of attachment of fibres continued from the *multifidus spinæ*, beneath them.

*Multifidus spinæ*.—The series of muscles so called arises by fleshy fibres from the transverse processes of the five last dorsal vertebræ, which pass upwards, forwards and inwards, to be inserted by four flat tendons into the spines of the seventh to the third dorsal vertebræ inclusive, and by the tendons of the *spinalis dorsi* into the two anterior dorsal spines.

*Obliquo-spinales*.—The removal of this muscle brings into view

\* 'Accessoires du long postérieur du cou,' Cuvier, *loc. cit.* p. 284.

a series of long, narrow, flat tendons, coming off from the spines of all the dorsal vertebræ, and slightly expanding as they proceed forwards and obliquely downwards and outwards; they become fleshy half-way from their origin, and are inserted into the posterior oblique and transverse processes of the six anterior dorsal vertebræ, and into the posterior oblique processes of the three last cervical vertebræ.

*Interspinales.*—The *interspinales* muscles do not exist in the region of the back, unless we regard the preceding oblique fibres as a modified representation of them. The most posterior fasciculus of muscular fibres, which is directly extended between the spinous processes, commences at the interspace of the spines of the two last cervical vertebræ, and the series is continued as far as the *vertebra dentata*.

*Interarticulares.*—The muscles which form the more direct continuation of the *obliquo-spinales* are continued from the posterior oblique or articular processes of one vertebra to the posterior articular process of the next in front.

*Obliquo-transversales.*—A third series of deep-seated intervertebral muscles is situated external to the preceding, and passes obliquely between the upper transverse process and the posterior articular process of the vertebra in front. These fasciculi appear to be a continuation of the *multifidus spinæ* in the neck.

*Intertransversales.*—There are also two series of short carneous fasciculi passing the one between the upper, and the other between the lower transverse processes.

*Levatores costarum.*—The first or most anterior of this series of muscles seems to represent the *scalenus medius*; it arises from both the upper and lower transverse processes of the last cervical vertebra, and expands to be inserted into the first rib, and into the upper and outer part of the second rib. The remaining *levatores* successively diminish in size as they are placed backwards; they come off from the transverse processes of the six first dorsal vertebræ; those from the first and second expand to be inserted into the rib attached to the same transverse process and to the one next behind; the rest have a single insertion: the angle and the part of the rib immediately beneath are the situations of their attachments.

### B. In Front of the Neck.

*Longus colli.*—This muscle is represented by a series of closely succeeding long, narrow fasciculi, arising from the hæmapophyses of the sixth to the first dorsal and from the ten posterior cervical vertebræ; and sending narrow tendons, which increase in length as they are given off more anteriorly, obliquely forwards and outwards, to be inserted into the costal processes of all the cervical vertebræ save the two first: the highest or foremost tendon is attached to the tubercle at the under part of the ring of the atlas; but this tendon is also the medium of insertion of a fasciculus of muscular fibres arising from the upper transverse processes of the sixth, fifth, fourth, third and second cervical vertebræ.

The *Rectus capitis anticus major* is continued, or arises by as many



distinct tendons, from the five superior tendons of insertion of the preceding muscle; these origins soon become fleshy, converge, and coalesce previous to their insertion into the base of the skull.

The *Rectus capitis anticus minor* is a strong fleshy triangular muscle arising from the anterior part of the body of the first four cervical vertebræ.

The *Rectus capitis lateralis* arises from the upper transverse processes of the sixth to the second cervical vertebra inclusive.

The *Intertransversales* are short, ill-defined muscles, blended with aponeurotic processes which pass from one transverse process longitudinally to the next in advance.

### C. Muscles of the Tail.

*Levator caudæ*.—*Origin*. From the posterior and superior extremity of the ischium. *Ins*. Into the spines of the caudal vertebræ.

*Adductor caudæ superior*.—This muscle is smaller than the preceding, with which it runs parallel; it rises below from the posterior extremity or tuber of the ischium, and is inserted into the transverse processes of the caudal vertebræ.

*Adductor caudæ inferior*.—*Origin*. From the tuber ischii, and the ligament connecting this with the posterior extremity of the pubis. *Ins*. Into the transverse processes of the caudal vertebræ.

*Depressor caudæ*.—*Origin*. From the under part of the middle line of pelvis. *Ins*. Into the inferior spines of the caudal vertebræ.

### D. Muscles of the Abdomen.

*Obliquus externus abdominis*.—*Origin*. Fleshy, from the second and third ribs, and by a strong aponeurosis from the succeeding ribs near the attachment of the costal processes, and from those processes. *Ins*. The fleshy fibres are continued from this aponeurotic origin to nearly opposite the ends of the vertebral ribs; they run almost transversely, very slightly inclined towards the pubis, to within half an inch of the linea alba, and there terminate, by an almost straight, parallel line, in their aponeurosis of insertion. The fibres of this aponeurosis decussate those of the opposite side, and adhere to the tendinous intersections of the *rectus* beneath. The aponeurosis from the last rib passes to be inserted into a strong ligament extending between the free extremities of the *ossa pubis*, leaving the abdomen behind the last rib defended only by the *internal oblique* and *transversalis*.

*Obliquus internus abdominis*.—*Origin*. From the whole of the anterior and outer surface of the pubis; aponeurotic from the upper part, fleshy for half an inch from the lower or ventral extremity: the carneous fibres run longitudinally, and cannot be distinctly defined from the *intercostales* on their outer border, or from the *rectus abdominis* on their inner or mesial border, which forms the medium of the insertion of the internal oblique.

*Rectus abdominis*.—I give this name to the mesial continuation of the preceding muscle, which arises by a strong, flat, triangular tendon from the lower or ventral extremity of the pubis and from the inter-pubic ligament: it soon becomes fleshy; the carneous portion is interrupted by three broad, oblique, but distinct aponeurotic inter-

sections, and is finally inserted into the xiphoid and lateral processes of the sternum and the intervening fascia.

*Transversalis abdominis*.—A layer of loose, dark-coloured cellular tissue divides the internal oblique from the transverse abdominal, except at its origin from the pubis, and for half an inch anterior to that part.

The *transversalis* then proceeds to derive carneous fibres from the inner surface of the vertebral ribs near their lower third; they pass obliquely upwards and forwards, and terminate by a regular, slightly concave line midway between their origins and the extremities of the ribs; a strong aponeurosis passes thence to the linea alba, but becomes thin at the pubic region, where a mass of fat is interposed between it and the peritoneum.

*Diaphragm*.—This muscle presents more of its normal mammalian character in this than in any other known bird. It is perforated by vessels only, in consequence of the non-development of the abdominal air-cells. The origin corresponding to that of the lesser muscle in Mammalia is by two strong and distinct, short, tendinous pillars from the sides of the body of the last costal vertebra; they are united by a strong tendon or fascia, forming the anterior boundary of the aortic passage. The tendinous pillars may be traced forward for some way in the central aponeurosis, expanding without crossing; they are then lost in that aponeurosis, which is perforated by the gastric arteries and veins; divides anteriorly to give passage to the gullet and the apex of the heart; the aponeurosis expands over the anterior part of the thoracic air-cells, and becomes, at its lateral circumference, the point of attachment of muscular fibres arising from the inner surface of the anterior ribs, and forming apparently a continuation of the *transversalis abdominis*.

*Intercostales externi*.—*Origin*. From the posterior edge and extremity of the costal processes or appendages. *Ins*. They run down to be inserted severally into the rib posterior to that to which the process affording them origin is attached. These processes are supported by strong triangular aponeuroses continued from their anterior and upper margins, severally, to the rib anterior to them.

A strong muscle arises from the anterior or costal angle of the scapula, and passes backwards to be inserted into the extremity of the third vertebral rib and its corresponding sternal portion. This muscle is a direct inspirator.

#### MUSCLES OF THE ANTERIOR EXTREMITY.

*Serratus magnus anticus*.—This muscle consists of three portions; the first and anterior portion arises by a short, strong aponeurosis from the last cervical rib, and is inserted into the lower edge of the anterior two-thirds of the scapula: the second middle portion arises from the lower end of the second vertebral rib, near the attachment of the costal process, and from the anterior margin of the same rib, and is inserted into the lower edge of the posterior two-thirds of the scapula: the third, posterior and smallest portion rises from the costal process of the third rib, and ascends to be inserted into the posterior extremity of the scapula.

This muscle is a direct inspirator : by drawing down the scapula it depresses the sternum through the medium of the strong coracoideum, increases the angle between the vertebral and sternal ribs, and dilates the thoracic air-cells.

*Levator scapulae*.—This seems to be the most anterior portion of the series of muscles which constitute the *serratus magnus*. *Origin*. Two flat fleshy strips from the inferior transverse and costal processes of the last and penultimate cervical vertebræ. *Ins*. Into the inner and upper side of the middle third of the scapula. It depresses as well as draws forwards the scapula, and thus aids the *serratus* in the action of inspiration.

*Serratus anticus minor*.—*Origin*. From the outer part of the costal process of the sternum. *Ins*. Into the posterior part of the base of the coracoideum.

*Trapezius*.—This flattened oblong quadrilateral muscle arises from the fascia, extending upon the back from the spinous processes of the posterior cervical vertebræ, and is inserted into the conjoined extremities of the scapula and coracoideum.

There is no representative of the *rhomboidei*.

*Latissimus dorsi*.—This muscle consists, as usual in Birds, of two portions, both of which have their origin from a continuation of the fascia (attached to the dorsal spines) which also gives origin to the trapezius : the fibres of the smaller and anterior slip converge to their insertion : the fibres of the posterior and broader strip are slightly twisted, the posterior edge being folded inwards as they also converge to join the preceding, and to be inserted with it into the posterior and inner side of the proximal extremity of the humerus.

*Deltoides*.—This is a single long and narrow triangular muscle, of which the base is attached to the conjoined extremities of the scapula and coracoid, and to the capsule of the shoulder-joint ; the apical insertion is into the upper and outer third of the humerus, which this muscle directly raises.

*Infraspinatus*.—A muscle which may be compared either to the *infraspinatus* or *teres major* comes off from the lower margin of the anterior two-thirds of the scapula, passes behind the shoulder-joint, where it is closely attached to the scapula, and is inserted into the inner and posterior part of the proximal end of the humerus.

*Musculi pectorales*.—The pectoral muscles, which present their feeblest condition and lowest development in the *Apteryx*, are nevertheless similar in number and arrangement to those which in some birds of flight are known to outweigh all the other muscles of the body.

The *pectoralis major* is represented by two very thin triangular layers of muscular fibres, the anterior of which is three lines broad at its base, and is attached to the sternum immediately exterior to the perforation of that bone : the second, posterior, and somewhat narrower portion, rises immediately behind the preceding, from the osseous bridge separating the perforation from the notch ; the two portions converge as they extend upwards and outwards to unite and be inserted into the anterior and internal surface of the proximal third of the humerus.

The *pectoralis medius seu secundus* is a similar, thin, feeble, but broader triangular layer of carneous fibres; which arise anterior to the preceding, just below the coracoid socket of the sternum, and converge as they wind over the shoulder-joint to be inserted into the upper surface of the proximal extremity of the humerus, of which they thus become an elevator.

The *pectoralis minor seu tertius* arises above and between the origins of the *pectoralis secundus* and the anterior strip of the *pectoralis major*, also partly from coracoid process; its fibres converge to be inserted into the proximal end of the humerus, above and behind the *pectoralis major*.

*Coraco-brachialis*.—This is represented by two small strips of muscular fibres which rise from the posterior part of the coracoideum, and are inserted, one directly below the other, into the proximal third of the humerus.

*Obs.*—The close adherence to the ornithic type of the muscular system of the anterior extremity in the *Apteryx* is very remarkable, especially as regards the position and course of the *pectoralis medius*, since the physiological conditions of the circumstances attending that muscle are wanting in the *Apteryx*.

Here we have a true bird, exhibiting a remarkable modification of the whole ornithic structure, in reference to exclusively terrestrial life and nocturnal habits; and we learn, I think, from this adherence to a typical organization, in a very rare exception, that the teleological conclusions respecting that typical construction, as it is manifested in the general rule, are in no ways affected by such an exception; because the modification of one part necessarily affects that of many others, perhaps of the whole body. If, for example, the fixation and structure of the lungs require a broad sternum and concomitant modifications of the coracoid and scapula for the mechanical part of the respiratory process, then it may be more convenient for the levator of the humerus to rise below that bone from the sternum, and act in the due direction by a modification of its course; although the locomotion of the bird may in no way be facilitated by the aggregation of muscle beneath the centre of gravity, nor the size of the levator be such as to render its particular position a matter of any consequence in regard to that centre.

The motions of the rudimental wing and its terminal hook would seem to be produced as much by the cutaneous muscles which converge to be inserted into the integument connected with it, as by the feeble representatives of the true wing-muscles above described.

#### MUSCLES OF THE POSTERIOR EXTREMITY.

The most superficial of the muscles on the outer side of the leg is that broad thin expanded one which combines the functions of the *tensor vaginæ* and *rectus femoris*, and also, according to some anatomists, as Cuvier and Meckel, those of the *glutæus maximus*; since however it is exclusively inserted into the leg, I shall describe it with the other muscles moving that segment of the posterior extremity. The removal of this muscle, of the *sartorius*, and the *biceps cruris*, is requisite to bring into view the *glutæi*.

*Glutæus externus*.—The external *glutæus* (*glutæus medius* of Meckel), as in most Mammalia, is smaller than the middle or internal *glutæi*, but is relatively larger in the *Apteryx* than in birds of flight, in which it is described as the *pyriformis* by Cuvier. This muscle, however, besides its origin from the outside of the pelvis, overlaps part of the *glutæus medius*, and has its insertion into the femur at some distance below the great trochanter, all of which are marked characteristics of the *glutæus magnus*. *Origin*. It takes its origin from the superior margin of the *os innominatum*, extends along an inch and a quarter of that margin, directly above the hip-joint, and is chiefly attached by distinct short tendinous threads, which run down upon the external surface of the muscle: it rises also by carneous fibres from the external surface of the innominatum for three lines below the superior margin. *Insertion*. The fibres converge and pass into a tendinous sheet, beginning on the external surface of the muscle half-way down its course, which ends in a broad, flat, strong tendon, inserted into a rising on the outer side of the femur nearly an inch below the great trochanter. It abducts and raises the femur.

*Glutæus medius*.—*Origin*. A large triangular, strong and thick muscle, has an origin of three inches extent from the rounded anterior and superior margin of the ilium, and from the contiguous outer surface of the bone for an extent varying from an inch to eight lines. *Ins*. Its fibres converge to a strong, short, broad and flat tendon, implanted in the external depression of the great trochanter, having a bursa mucosa interposed between the tendon and the bony elevation anterior to the depression.

*Glutæus minimus*.—*Origin*. It rises below the preceding muscle from the anterior and inferior extremity, and from one inch and three-fourths of the inferior and outer margin of the ilium, and contiguous external surface, as far as the origin of the *glutæus medius*; also by some fleshy fibres from the outside of the last rib. *Ins*. These fibres slightly converge as they pass backwards to terminate in a broad flat tendon which bends over the outer surface of the femur, to be inserted into the elevation anterior to the attachment of the *glutæus magnus*.

A muscle which may be regarded either as distinct, or a strip of the preceding one, arises immediately behind it from half an inch of the outer and inferior part of the ilium; its fibres run nearly parallel with those of the *glutæus minimus*, and terminate in a thin flat tendon, which similarly bends round the outer part of the femur, to be inserted into the outer and under part of the trochanter immediately below the tendon of the *glutæus medius*. This muscle is peculiar to the *Apteryx*, and the preceding portion, or *glutæus minimus*, is absent in most birds.

*Use*.—All the preceding muscles combine to draw the femur forwards, and to abduct and rotate it inwards.

*Iliacus internus*.—This is a somewhat short thick muscle, of a parallelgrammic form, fleshy throughout; rising from the tuberosity of the innominatum in front of the acetabulum immediately below the *glutæus minimus*, and inserted at a point corresponding to the inner trochanter, into the inner side of the femur near the head of that

bone, which it thus adducts and rotates outwards. This muscle is present both in the Ostrich and Bustard, but Meckel says it is wanting in the Cassowary.—Arch. xiii. 261.

*Pyramidalis*.—The same kind of modification which affects the *iliacus internus*, viz. the displacement of its origin from the inner surface of the ilium to a situation nearly external, affects this muscle, which, from its insertion and triangular form, I regard as the analogue of the *pyramidalis*. It arises fleshy from the outer surface of the extended ischium for the extent of an inch, and converges to a broad flat tendon which is inserted into the *trochanter femoris* opposite, but close to, that of the *glutæus minimus*, which it opposes, abducting and rotating the femur outwards.

*Adductor brevis femoris*.—A small, long and slender muscle arises from the innominatum immediately behind the acetabulum, passes over the back part of the great trochanter, becomes partially tendinous, and is inserted into the back part of the femur in common with the following muscle.

*Adductor longus*.—A long broad and thin muscle, separated from the preceding by the ischiadic nerve and artery. The origin of this muscle extends one inch and a quarter from near the upper margin of the innominatum which is behind the acetabulum; it is joined by the preceding strip, and is inserted into the whole of the lower two-thirds of the back part of the femur.

*Adductor magnus*.—This broad and flat muscle has an extensive origin (two inches) from the outer edge of the ischium and the obturator fascia; its fibres slightly diverge as they pass downwards to be inserted into the back part of the lower half of the femur, and into the upper and back part of the tibia.

*Obturator internus*.—This arises from the inner side of the opposite margins of the pubis and ischium, where they form the posterior boundary of the *obturator foramen*, and from the corresponding part of the *obturator fascia*; the fleshy fibres converge in a slightly peniform manner to the strong round tendon which glides through the notch, separated from the rest of the foramen by a short, strong, transverse, unossified ligament, and is inserted into the posterior part of the base of the trochanter. In its length and size this muscle resembles the corresponding one in the Ostrich and other Struthious birds.

*Gemellus*.—This is represented by a single small fleshy strip arising from the margin of the *obturator foramen*, close to the emergence of the tendon of the *obturator internus*, with which it is joined, and co-inserted into the femur.

*Quadratus*.—I consider a broad fleshy muscle which arises from the pubis, below the *obturator foramen*, and which increases in breadth to be inserted into the femur internal and posterior to the obturator tendon, to be the true analogue of the *quadratus femoris*.

#### MUSCLES OF THE LEG.

*Tensor vaginæ* and *Rectus femoris*.—The largest and most remarkable of the muscles which act upon the bones of the leg is that already alluded to as the most superficial of those on the outer side of the thigh. It has a broad, thin, triangular form, arises from

the spines of the sacrum by a strong but short aponeurosis which soon becomes fleshy; the carneous fibres converge as they descend\*, and pass into a thin aponeurosis at the lower third of the thigh: this is closely attached to the muscles beneath (*vastus externus* and *cruræus*), then spreads over the outer and anterior part of the knee-joint, is inserted into the patella, and into the anterior process of the head of the tibia.

Owing to the great antero-posterior extent of the origin of this muscle, its anterior fibres are calculated to act as a flexor, its posterior ones as an extensor of the femur: all together combine to abduct the thigh and extend the leg, unless when this is in a state of extreme flexion, when a few of the posterior fibres glide behind the centre of motion of the knee-joint.

*Sartorius*.—The origin of this muscle is proportionally as much extended as that of the preceding, with which it is posteriorly continuous: it comes off aponeurotic, from the anterior and superior margin or labrum of the ilium; the fibres soon become fleshy, and the muscle diminishes in breadth and increases in thickness as it descends: it is inserted by short and strong tendinous filaments obliquely into the anterior part of the tendon of the broad *rectus*, and into the upper and anterior end of the tibia. Its insertion is partly covered by the internal head of the *gastrocnemius*.

It bends and adducts the thigh, and extends the leg.

*Biceps flexor cruris*.—This is a single muscle, corresponding with the preceding in the characteristic modifications of its extended origin, in relation to the great antero-posterior development of the pelvic bones. It is exposed by the removal of the broad *rectus*. *Orig.* By a broad and thin aponeurotic tendon, which at first is confluent with that of the *rectus*, but soon becomes distinct. *Ins.* The fleshy fibres converge as they descend along the back and outer part of the thigh, and finally terminate in a strong round tendon, which glides through a loop formed here principally by a splitting of the tendinous origin of the *gastrocnemius externus*, and is inserted into the process on the outside of the fibula one inch from its proximal extremity. By means of the loop† the weight of the hinder parts of the body is partially transferred, when the leg is bent, to the distal end of the femur; and the biceps is enabled, by the same beautiful and simple mechanism, to effect a more rapid and extensive inflection of the leg than it otherwise could have produced by the simple contraction of its fibres.

*Semimembranosus*.—*Origin.* From the side of the coccygeal vertebrae, and from the posterior end of the ischium; it crosses the

\* They are not divided into a superficial and deep layer, as in the Ostrich, but form a simple stratum, as in the Cassowary. Meckel regards the *rectus* as entirely wanting in the Cassowary, supposing the present muscle to be the analogue of the *glutæus maximus* and *tensor vaginæ* united. He says that Professor Nitzsch observed a like absence of the *rectus femoris* in the Emeu. The muscle which these anatomists call the *rectus* in other birds, is a strip of the *cruræus*, arising high up from the femur, and which in the Ostrich takes its origin from the *os pubis*.

† Which in the common fowl is formed chiefly by a ligament extended from the back of the outer condyle of the femur to the head of the tibia.

superficial or internal side of the *semitendinosus*. *Ins.* Into the fascia covering the *gastrocnemius* and the inside of the tibia.

*Semitendinosus*.—This muscle arises from the posterior and outer part of the *sacrum* and *ischium*: it is a flattened triangular muscle, which receives the square *accessorius* muscle from the lower and posterior part of the femur. It gradually diminishes as it descends, and having passed the knee-joint, sends off at right angles a broad and square sheet of aponeurosis, which glides between the two origins of the *gastrocnemius internus*, and is inserted into the lower part of the angular ridge continued from the inside of the head of the tibia. The terminal tendon, continued from the apex of the muscle, then runs along the outer or fibular margin of the internal head of the *gastrocnemius*, and becomes confluent with the terminal tendon of that muscle.

*Cruræus*.—This is a simple but strong muscle: it commences at the upper and anterior part of the thigh by two extremities, of which the outer and upper one has its origin extended to the base of the trochanter; the inner and inferior comes off from the inner side of the femur, beneath the insertion of the *glutæus magnus*; the two portions blend into one muscle much earlier than in the Ostrich.

*Gracilis*.—On the inner side of the *cruræus*, but more superficially, lies a narrow, compressed, long muscle, which rises by two heads, one from the anterior and upper part of the femur, the other from the os pubis; both soon become blended together and transmit a broad thin tendon to be inserted into the lower and lateral part of the patella with the *cruræus*.

*Vastus internus*.—Two other muscles succeed the preceding, and rise beneath it from the inner and anterior part of the femur; they have a similar insertion, and obviously represent the *vastus internus*. The fibres converge to a middle aponeurosis, which increases to a strong short tendon, inserted into the upper and anterior projection of the tibia.

*Popliteus*.—This small muscle is brought into view when the superficial muscles of the leg which are inserted into the foot are removed. Its carneous fibres extend from the fibula inwards and downwards to the tibia. It is of relatively smaller extent than in the Cassowary.

*Gastrocnemius*.—This consists, as in other birds, of several distinct portions, the chief of which correspond with the external and internal origins of the same muscle in the Mammalia. The *gastrocnemius externus* has two strong, narrow, rather flattened tendinous origins, which are attached, one about a line below the other, to the external ridge above the outer condyle of the femur; they are continued into each other about an inch below their bony attachments, and thus form a loop or pulley (lined by a synovial sheath) through which the tendon of the biceps glides; a strong ligament from the outer ridge of the fibula passes backwards to be attached to the confluence of the two tendons. The carneous fibres of the external *gastrocnemius* come off from the outer side of the inferior of these tendons, and from the fascia covering the outer surface of the muscles of the leg: they are continued in a somewhat penniform arrangement two-thirds down the leg, upon the inner surface of the



muscle, where they end in a strong subcompressed tendon. This joins its fellow tendon, from the internal *gastrocnemius*, behind the ankle-joint, and both expand into a thick, strong, ligamentous aponeurosis, which extends over three-fourths of the posterior part of the tarso-metatarsal joint. The lateral margins of this fascia are bent down under the flexor tendons behind the joint, and become continuous with a strong ligamentous layer gliding upon the posterior surface of the distal condyles of the tibia, and attached to the tendons of the *peroneus* and *tibialis anticus*; the conjunction of the thickened tendons of the *gastrocnemii* with this deeper-seated layer of ligamentotendinous substance constitutes a trochlear sheath lined by synovial membrane, through which the flexor tendons of the toes glide. The synovial membrane of the ankle-joint is continued upwards half an inch above the articular surface of the bone, between it and the cartilaginous pulley. Below the joint the margins are inserted into the lateral ridges of the tarso-metatarsal bone, becoming gradually thinner as they descend, and ending below in a thin semilunar edge directed downwards.

The *gastrocnemius internus* has two powerful heads, one from the femur, the other from the tibia; the first arises fleshy from the internal condyle of the femur, expands as it descends, and receives additional fibres from the lower edge of the *accessorius semitendinosi*. About one-fifth down the tibia, this muscular origin, in the right leg, terminated in a short flattened tendon, which became attached to the inner side of the tibial portion of the *gastrocnemius internus*. In the left leg the tendon soon divided; one portion passed to the soleus, the other went to join the tibial portion of the *gastrocnemius internus*. The second head, which is separated from the preceding by the insertion of the *semitendinosus*, arises partly from the internal and anterior part of the strong fascia of the knee-joint by short tendinous fibres, which almost immediately become fleshy, and partly from a well-defined triangular surface on the inner and anterior aspect of the head of the tibia: the fleshy fibres converge, receive the tendinous slip from the femoral portion, and end on the inner side of the muscle in a strong flattened tendon, about two-thirds down the leg: this joins the tendon of the *gastrocnemius externus*, and is inserted as described above.

*Soleus*.—A slender flattened muscle arising from the inner and posterior side of the tibia, the tendon of which joins that of the *gastrocnemius internus*, behind the tarsal joint.

The *flexor perforatus* of the inner toe lies immediately anterior to the external *gastrocnemius*; it arises fleshy from the outer condyle of the femur, below the tendinous origin of that muscle, and terminates in a slender flat tendon half-way down the leg. Its tendon glides behind the tarsal joint through the sheath of the *gastrocnemius*, expands beneath the metatarsal joint, perforates the flexor of the proximal phalanx of the third toe, and then bifurcates to be attached to the sides of the second phalanx, giving passage to the perforans tendon of the last phalanx.

*Flexor perforatus* of the middle toe.—This arises by very short tendons from the proximal end of the fibula, and from the ligament

attached to the bicapital pulley : it continues to derive a thin stratum of fleshy fibres from the fascia covering the anterior surface of the muscles of the leg : the fleshy fibres terminate half-way down the leg in a flattened tendon, which pierces the tendon of the first *perforatus* of the middle toe, then runs forward to the outer toe, expands into a thick ligamentous substance beneath the proximal phalanx, and sends off two tendinous attachments on each side, one to the proximal, the other to the second phalanx, and is continued to be finally inserted into both sides of the third phalanx.

*Flexor perforatus digitorum pedis* is the strongest of the three ; it arises fleshy from the posterior part of the distal extremity of the femur, above the external condyle, and also by a distinct flattened tendon, one inch in length, from the proximal end of the tibia : this tendon moreover receives the long slender tendon sent off obliquely across the front of the knee-joint from the *pectineus*, by which its origin is extended to the pelvis. This accessory tendon perforates the inner fleshy surface of the muscle, and is finally lost about half-way down the carneous part. Before the *flexor digitorum* is joined by the tendon of the *pectineus*, it subdivides posteriorly into four muscular fasciculi : the anterior division receives principally the above tendon. The muscle becomes wholly tendinous two-thirds down the leg ; its tendon passes through the posterior part of the pulley of the *gastrocnemius*, and expands as it passes along the metatarsus : a thick ligamentous substance is developed in it, opposite the joint of the proximal phalanx of the second toe, into the sides of which it is inserted, dividing for that purpose, and giving passage to the two other flexor tendons of that toe. The second portion of the present muscle terminates in a tendon situated behind the preceding, which passes through a distinct sheath behind the tarsal joint, expands into a sesamoid fibro-cartilage beneath the corresponding expansion of the previous tendon, which it perforates, and then becomes itself the perforated tendon of the second phalanx of the second toe, in the sides of which it is inserted. The third portion of this muscle ends in a somewhat smaller tendon than the preceding. The fourth and most posterior portion soon becomes a distinct muscle ; its fleshy fibres cease on the inner side, one-fourth down the leg, but on the outside they are continued three-fourths down the leg : its tendon passes through the gastrocnemial pulley behind the ankle-joint, and divides to form a sheath for the first *perforatus* of the fourth toe ; it is then joined by a tendon passing through a pulley across the external malleolus, and finally becomes the perforated tendon of the first metacarpal bone of the middle or third toe.

*Pectineus* (*Rectus anticus femoris* of Meckel).—This is a long, thin, narrow strip of muscle arising from the spine of the pubis, anterior to the acetabulum, and passing straight down the inner side of the thigh ; it degenerates into a small round tendon near the knee, which tendon traverses a pulley, formed by an oblique perforation in the strong rotular tendon of the extensors of the leg, and thus passing across the knee-joint to the outer side of the leg, finally expands, and is lost in the *flexor perforatus digitorum* last described. It is this muscle which causes the toes to be bent when the knee is bent.

*Peroneus longus*.—*Origin*: tendinous from the head of the tibia, and by carneous fibres from the upper half of the anterior margin of the tibia; these fibres pass obliquely to a marginal tendon, which becomes stronger and of a rounded form where it leaves the muscle. The tendon gives off a broad, thin, aponeurotic sheath to be inserted into the capsule of the tarsal joint; it is then continued through a synovial pulley on the side of the outer malleolus, and is finally inserted or continued into the perforated tendon of the middle toe.

*Tibialis anticus*.—This muscle is overlapped and concealed by the peroneus; it arises partly in common with that muscle, and partly by separate short tendinous threads from the outer part of the head of the tibia; it gradually becomes narrower, and finally tendinous two-thirds of the way down the leg; its strong tendon glides through the oblique pulley in front of the distal end of the tibia, expands as it passes over the ankle-joint, and is inserted into the anterior part of the proximal end of the tarso-metatarsal bone, sending off a small tendinous slip to the aponeurosis covering the extensor tendons of the toes, and a strong tendon which joins the fibular side of the following muscle.

*Extensor longus digitorum*.—This lies between the *tibialis anticus* and the front and outer facet of the tibia, from which it derives an extensive origin; its tendon commences half-way down the leg, runs along the anterior part of the bone, first under the broad ligamentous band representing the anterior part of the annular ligament, then through a ligamentous pulley, and inclines to the inner or tibial side of the anterior surface of the metatarsal bone, where it expands and divides into three tendons. Of these the innermost is given off first, and subdivides into two tendons, one of which goes to be inserted into the base of the last phalanx of the second toe; the other portion is principally inserted into the middle toe, but also sends off a small tendon to the inner side of the proximal phalanx of the second toe. The second tendon is inserted by distinct portions into the second, third and last phalanges of the middle toe. The third tendon supplies the outer toe.

*Extensor brevis digitorum*.—A small extensor muscle arises from the insertion of the *tibialis anticus*, and sends its tendon to the outer side of that of the great *extensor digitorum*.

*Extensor pollicis brevis*.—An extensor of the small innermost toe arises from the upper and inner side of the tarso-metatarsal bone.

*Flexor perforans digitorum*.—This strong penniform muscle arises fleshy from nearly the whole of the outer surface of the fibula, also from the posterior part of the tibia and the interosseous space; the tendon of the biceps perforates its upper part in passing to its insertion. It ends in a strong flat tendon at the lower third of the leg, which tendon runs through a particular sheath at the back part of the tarsal pulley, becomes thickened and expanded as it advances forwards beneath the tarsus, receives a strong accessorial tendon from the muscle which bends the innermost toe, and finally divides into three strong perforating tendons, which bend the last joints of the three long toes.

In the outer, or fourth toe, both the *perforans* and *perforatus* ten-

dons are confined by a double annular ligament; the exterior one being continued from the adjoining toe, the inner and stronger one from the sides of the proximal phalanx of the outer toe.

The second and third toes have two perforated tendons; one inserted into the sides of first, and the other into sides of second phalanx.

Mr. Gould then proceeded to characterize a new species of *Peramèles* from Port Essington, and a new species of *Dasyurus* from the same locality.

**PERAMELES MACROURA.** *Per. corpore suprâ nigro et flavescenti-albo penicillato, infrâ sordidè albo; pilis rigidis obsito; caudâ pilis parvulis parcè tectâ, longitudine dimidio corporis æquante; suprâ nigrâ, infrâ fuscescenti-albâ; auribus mediocribus.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin . . .	16	3
———— caudæ . . . . .	7	3
———— ab apice rostri ad basin auris . . .	3	4
———— tarsi digitorumque . . . . .	3	1
———— auris . . . . .	1	2

*Hab.* Port Essington.

The *P. macroura* greatly resembles the *P. nasuta*, having the same elongated form of head, character of fur and colouring, but is distinguishable by its longer tail.

**DASYURUS HALLUCATUS.** *Das. suprâ flavescenti-fuscus, nigro-penicillatus, maculis albis ornatus; corpore infrâ albo; caudâ im-maculatâ ad apicem nigrâ.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin . . .	11	0
———— caudæ . . . . .	9	0
———— ab apice rostri ad basin auris . . .	2	6
———— tarsi digitorumque . . . . .	1	1½
———— auris . . . . .	1	0

*Hab.* Port Essington.

This species most nearly resembles the *Dasyurus Geoffroi*, but is of a smaller size, and has the thumb of the hind-foot more developed.

Accompanying the specimen from which the above description is taken was another individual, which differs only in having the ground-colour of the body nearly black; hence it would appear that the present species is subject to the same kind of variation in its colouring as the *Dasyurus Maugei*, the black variety of which has received the name *viverrinus*.

#### LINNÆAN SOCIETY.

June 7, 1842.—The Lord Bishop of Norwich, President, in the Chair.

Read “An Account of a Fish, nearly allied to the genus *Hemiramphus*, taken in Cornwall.” By Jonathan Couch, Esq., F.L.S., &c.

Mr. Couch states, that in the month of August 1841, several individuals of this little fish were found swimming at the surface of a large pool in the rocks near Polperro, where they had been left by the receding tide, having been swept thither by a continued south-west wind, which had also driven in many individuals of *Motella*

*glauca* and other fishes that do not ordinarily select such a situation. Their length was half an inch; the head proportionately large, especially across; the body slender; eye large; snout in front of it short and abrupt; upper jaw arched; under stout, projecting to a considerable extent, but in some specimens more than in others, the point declining, and the sides not appearing to be formed of parallel rami of the jaw, but rather of a cartilaginous substance; vent placed posteriorly; body, which is equal from the head to this point, tapering thence to the tail; lateral line, so far as could be distinguished, straight; dorsal and anal fins single, posterior, opposite, the latter beginning close behind the vent, and both reaching nearly to the tail, their membrane at first broader, but narrowing in its progress; pectoral fins and tail round. The colours of different specimens varied greatly, some being dark with a tint of green, others cream-coloured but sprinkled with specks; regular and thickly set narrow stripes passed from the back obliquely forward, breaking into dots at the sides, in the darker coloured specimens; belly dark.

Mr. Couch was unable to discover ventral fins even with the aid of a lens. He has no doubt of the specimens being in a very early stage of their existence, but cannot refer them to any known species. He thinks it indeed doubtful whether they really belong to the genus by the name of which he has provisionally designated them, or even to the same family, some parts of their structure seeming to indicate an affinity with the genus *Ammodytes*.

The paper was accompanied by magnified figures.

June 21.—Edward Forster, Esq., V.P., in the Chair.

Read "Observations on the Growth and Reproduction of *Enteromorpha intestinalis*." By Arthur Hill Hassall, Esq.

Mr. Hassall states that, in the earliest stage of their development, the tapering filaments consist of a single series of cells placed end to end. Each of these cells afterwards becomes bisected by a longitudinal line, and other lines subsequently appear, so that the original cells are ultimately divided into several, each of which in its turn enlarges and is in like manner divided. From the continued growth and unlimited division of the cells, the filaments increase to an indefinite size, soon lose their original confervoid character, present a reticulated appearance, and instead of being attenuated become cylindrical and hollow.

Mr. Hassall proceeds to state, that in each articulation of the filaments, and often when they are not thicker than a horse-hair, a dark central nucleus is gradually developed, which is the reproductive germ. He thinks there can be little doubt that this, as well as the cell in which it is contained, undergoes repeated division in the same manner as the reproductive globules of the *Ulvæ*. These reproductive bodies germinate while still inclosed within the cells in which they were developed, and while the parent filament retains all its freshness and vigour, giving rise to the jointed and tapering filaments first described; which in this state, after the rupture of the parent cell, and while their bases are still fixed within it, bear a strong resemblance to a parasitic *Conferva*. This development, division and growth of cells and reproductive bodies appears, Mr. Hassall adds,

to be going on continually and successively, so that most specimens of the plant present examples of each different stage of its formation.

These observations lead Mr. Hassall to regard *Enteromorpha intestinalis* as having a twofold relation, viz. to the *Confervæ* in its young articulated filaments, and to the *Ulvæ* in its reproduction from globules which undergo repeated division. He objects to the tautology of the specific name, and proposes that of *lacustris* in its place.

Read also the conclusion of Mr. Clark's paper "On the Sea Cocoa-nut of the Seychelles, *Lodoicea Sechellarum*, Comm. and Labill."

[The substance of this paper has been already given in vol. vi. p. 408, and also in the Proceedings of the Bot. Soc. of Lond., p. 153 of our last Number.]

November 1.—R. Brown, Esq., V.P., in the Chair.

Read "A Notice of the African Grain called Fundi or Fundungi." By Robert Clarke, Esq., Senior Assistant Surgeon to the Colony of Sierra Leone. Communicated by Jacob Bell, Esq., F.L.S.

This Lilliputian grain, which is described by Mr. Clarke as being about the size of mignonette-seed, is stated to be cultivated in the village of Kissy and in the neighbourhood of Waterloo by industrious individuals of the Soosoo, Foulah, Bassa and Joloff nations, by whom it is called "hungry rice." The ground is cleared for its reception by burning down the copse-wood and hoeing between the roots and stumps. It is sown in the months of May and June, the ground being slightly opened and again lightly drawn together over the seed with a hoe. In August, when it shoots up, it is carefully weeded. It ripens in September, growing to the height of about eighteen inches, and its stems, which are very slender, are then bent to the earth by the mere weight of the grain. They are reaped with hooked knives. The patch of land is then either suffered to lie fallow, or planted with yams or cassada in rotation. Manure is said to be unnecessary or even injurious, the plant delighting in light soils and being raised even in rocky situations, which are most frequent in and about Kissy. When cut down it is tied up in small sheaves and placed in a dry situation within the hut, for if allowed to remain on the ground or to become wet the grains become agglutinated to their coverings. The grain is trodden out with the feet, and is then parched or dried in the sun to allow of the more easy removal of the chaff in the process of pounding, which is performed in wooden mortars. It is afterwards winnowed with a kind of cane fanner on mats.

In preparing this delicious grain for food, Mr. Clarke states that it is first thrown into boiling water, in which it is assiduously stirred for a few minutes. The water is then poured off and the natives add to it palm oil, butter or milk; but the Europeans and negroes connected with the colony stew it with fowl, fish or mutton, adding a small piece of salt pork for the sake of flavour, and the dish thus prepared is stated to resemble kous-kous. The grain is also made into a pudding with the usual condiments, and eaten either hot or cold with milk; the Scotch residents sometimes dressing it as milk-porridge. Mr. Clarke is of opinion that if the fundi grain were raised for exportation to Europe, it might prove a valuable addition to the

list of light farinaceous articles of food in use among the delicate or convalescent.

Specimens of the grass accompanied Mr. Clarke's communication, and were examined by Mr. Kippist, Libr. L.S., who added some observations on its botanical characters.

It is a slender grass with digitate spikes, which has much of the habit of *Digitaria*, but which, on account of the absence of the small outer glume existing in that genus, must be referred to *Paspalum*. Mr. Kippist regards it as an undescribed species, although specimens collected at Sierra Leone by Afzelius are in the collections of Sir James E. Smith and Sir Joseph Banks, on the former of which Afzelius has noted that it is much cultivated by the negroes in Sierra Leone.

Mr. Kippist distinguishes the species by the following characters:—

*Paspalum exile*, glaberrimum, caule filiformi, racemis subternis digitatis, axi partiali spiculis singulis angustiore, spiculis parvis sub-biserialibus pedicellatis, glumis ovatis acutiusculis paleis æqualibus, foliis linearilanceolatis margine serrulatis.

Gramen sub-bipedale, infernè ramosum; racemi tenues, 3—4-pollicares, subsessiles; axes partiales angustissimæ, planæ, margine minutè denticulatæ; spiculæ vix lineales; glumæ exterioris respectu racheos, (valvulæ floris masculi superstitis) nervi 7—9 æquidistantes, interioris 5, quorum laterales approximati; paleæ minutissimè striatæ; folia plana; vaginæ longissimæ; ligulæ truncatæ integræ.

Read also a letter from N. B. Ward, Esq., F.L.S., containing a statement furnished to him by Mrs. Williams, the widow of the late missionary of that name, respecting the transportation of the *Musa Cavendishii* to the Navigators' Islands, and its culture there. Mr. Williams left England on the 11th of April 1839, and arrived at Upolu, one of the Navigators' Islands, at the end of November. He carried with him, in one of Mr. Ward's glazed cases, a young plant of *Musa Cavendishii*, which bore the voyage well. It was transplanted into a favourable situation, and in May 1840 a cluster of fine fruit (in number exceeding 300) was produced; after which the parent plant died, leaving behind more than thirty suckers, which were distributed to various parts of the island. In May 1841, when Mrs. Williams left to return to England, the greater part of these were in a fructifying state, so that there cannot be a doubt of this valuable plant quickly becoming abundant, not only in Upolu, but also in the neighbouring islands. Mrs. Williams further states that the fruit is highly prized by the natives as being much finer and very different in flavour from any of the species or varieties previously growing in these islands.

November 15.—E. Forster, Esq., V.P., in the Chair.

Read a Note "On the permanent varieties of *Papaver orientale*, L." By T. Forster, M.B., F.L.S., &c.

Dr. Forster states, that ever since the introduction of *Papaver bracteatum*, Lindl., into England, he has regarded it as a permanent variety of *P. orientale*, of which *P. bracteatum*, as having fertile seeds, while those of *P. orientale* are usually sterile, was to be considered the original plant. He retains, however, the name of *orientale* for

the species, both as being the earlier and as being applicable to all the varieties, four of which he now distinguishes as permanent by the following characters :—

1. *P. orientale bracteatum*, characterized by its height, its bractææ, its large and deep red petals, and its uniformly perfect seeds.

2. *P. orientale præcox*, the common "Monkey Poppy" of the old gardeners, and the most common variety in England, distinguished by its somewhat depressed capsule and sterile seeds. It flowers along with the former, generally about the 10th of May, the flowers being of a fine deep orange inclining to cinnabar.

3. *P. orientale serotinum*, resembling the last except in that its petals incline more to what is called salmon-colour, but principally characterized by its flowering nearly a month later, along with *P. somniferum*, L., early in June. Dr. Forster has several times tried in vain to make it flower with the commoner sort. The seeds are always imperfect, and the flower and capsule of the same shape as in the last.

4. *P. orientale, capsulâ et floribus longioribus*, which are its principal distinguishing characters. It flowers in May a few days after the old English sort, but is only met with on the Continent: the petals are of the same colour, but the leaves are rather smaller. Dr. Forster states it to be common in the gardens of Belgium as the only variety cultivated, the two last-named varieties being there unknown. It holds a middle rank between them and *P. orientale bracteatum*, being tall and bearing seeds, which are sometimes prolific, and well deserves to be introduced into English gardens.

Dr. Forster adds, that about ten years ago Mr. Curtis showed him a bed of seedlings of the second year in full flower in May, which had round capsules and orange flowers like *P. orientale*, but which he stated to have been derived from seeds of *P. bracteatum*. Mr. Curtis attributed the change to the bees having transported the pollen of that plant, but the uniform appearance of the whole bed led Dr. Forster to think this explanation doubtful. He further states, that he has been assured in the South of Europe that the best opium and in the largest quantity is obtained from *P. orientale bracteatum*; and as this plant suits the English soil and seeds freely, he thinks it might often be advantageously substituted for *P. somniferum*.

Read also a Note "On *Secale cornutum*, the *Ergot* of Rye;" and "On a species of *Asplenium*, related to *A. Trichomanes*, L." By A. Haro, M.D., of Metz, communicated by the Secretary.

In the latter communication Dr. Haro calls attention to a fern discovered by himself in the well of an old castle. The well in which it was found is described as being large, four-cornered, and having at the top on one side a square window, freely admitting air and light. The opposite wall is lined with the fern, which lies flat upon the stones, to which the fronds are said to be attached throughout their length by slender roots, rendering it difficult to remove them even with a knife. Dr. Haro submitted the plant to a Professor of the faculty of Nancy, who regarded it as a new species, more distinct from *A. Trichomanes* than *A. viride* or *A. Petrarchæ*, and supplied the following descriptive characters of these four species :—

*A. Trichomanes*, frondes *patulæ, glabræ, impari-pinnatæ*; stipes nigres-



centi-vernicosus, suprâ membranulâ crenulatâ et ab insertione pinnularum utrinque decurrente manifestè *appendiculatus*; pinnulæ mediæ *ovatæ* inæquilaterales, superiores oblongæ et basi obliquè cuneatæ, impar crenulata, omnes obtusæ *obtusè*que crenatæ.

A. HAROVII, frondes *decumbentes* saxoque fibrillis tenuissimis adfixæ, *glabræ*, impari-pinnatæ; stipes nigrescenti-vernicosus, suprâ membranulâ obsoletâ et ab insertione pinnularum utrinque decurrente *appendiculatus*; pinnulæ mediæ *hastato-rhomboidæ*, *trilobatæ*, superiores oblongæ basi obliquè attenuatæ vel cuneatæ, impar pinnatifida, omnes obtusæ sed *acutè* dentatæ.

A. *viride*, frondes *erecto-patulæ*, *glabræ*, impari-pinnatæ; stipes viridis, suprâ canaliculatus, *inappendiculatus*; pinnulæ mediæ ferè omnes ovato-rhomboidæ, inæquilaterales, impar crenulata incisa, omnes obtusæ *obtusè*que crenulatæ.

A. *Petrarchæ*, frondes *erecto-patulæ*, *glanduloso-villosæ*, impari-pinnatæ; stipes obscurè nigrescens, suprâ applanato-caliculatus, *inappendiculatus*; pinnulæ mediæ *oblongæ* basi obliquè truncatæ vel *cuneatæ* et inde valdè inæquilaterales, pinnatifidæ, lobulis obtusis inæqualiter crenulatis, superiores supra rachin decurrentes.

### MISCELLANEOUS.

ON THE PRESENCE OF THEINE IN THE LEAVES OF ILEX PARAGUYENSIS.

RECENT chemical researches have proved that the bitter tonic substance called *Theine*, found in the leaves of tea, is identical with *Caffeine*, obtained from the seeds of coffee. On this subject Liebig remarks—"We shall never, certainly, be able to discover how men were led to the use of the hot infusion of the leaves of a certain shrub (tea), or of a decoction of certain roasted seeds (coffee). Some cause there must be, which would explain how the practice has become a necessary of life to whole nations. But it is surely still more remarkable that the beneficial effects of both plants on the health must be ascribed to one and the same substance, the presence of which in two vegetables, belonging to different natural families and the produce of different quarters of the globe, could hardly have presented itself to the boldest imagination."

It is curious to remark, that a beverage called Guarana, used by the people on the banks of the Amazon, and in all probability procured from the leaves of *Paullinia sorbilis*, should yield a crystalline matter also identical with Theine, and that Theobromine, or the principle yielded by chocolate, should be in many respects analogous. Mr. John Stenhouse of Glasgow has recently detected Theine in the leaves of the *Ilex paraguayensis*, Yerba Maté, or Paraguay Tea, which is the common beverage of a large portion of the inhabitants of South America.

This is a fact of great interest, when taken in connexion with the previous discoveries above alluded to, as tending to show that the same principle is found in many of those substances which are employed by mankind in different parts of the world to furnish a tonic and refreshing beverage. Theine is procured easily according to Mr. Stenhouse, by making an infusion of tea, precipitating by acetate of lead, filtering, evaporating the clear solution to a thickish consistence, and then subliming (?) from a sand-bath. In this way he has been able to procure  $1\frac{1}{2}$  per cent. from Assam tea without the use of